R E P O R T R E S U M E S

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PLANNING GUIDELINES FOR CONSTRUCTION OF FACILITIES AT THE STATE-SUPPORTED COLLEGES AND UNIVERSITIES IN COLORADO.
ASSOCIATION OF STATE INST. OF HIGHER EDUC. IN COLO

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DESCRIPTORS- *COLLEGE BUILDINGS, *COLLEGE PLANNING, *CONSTRUCTION NEEDS, *FACILITY GUIDELINES, *FACILITY UTILIZATION, LIBRARIES, MASTER PLANS, PHYSICAL FACILITIES, RESEARCH UTILIZATION, SCIENCE FACILITIES,

GUIDELINES ARE PRESENTED TO INSURE UNIFORM PLANNING AT THE EIGHT STATE-SUPPORTED INSTITUTIONS OF HIGHER LEARNING IN COLORADO. TWO PLANNING CONSULTANT FIRMS SUBMITTED UTILIZATION CRITERIA AND SQUARE FOOTAGE CRITERIA WHICH WERE USED TO DEVELOP STANDARDS FOR PLANNING IN THE STATE INSTITUTIONS. STANDARDS WERE SET FOR (1) CLASSROOM UTILIZATION, (2) ALLOCATION OF SPACE, (3) STATIONS BY ROOM TYPE, (4) LABORATORY UTILIZATION, (5) RATIO OF OFFICE SERVICE SPACE TO PRIMARY SPACE, (6) SPACE FOR RESEARCH UTILIZATION, (7) LIBRARY FACILITIES, AND (8) PHYSICAL EDUCATION FACILITIES. THE SUGGESTED STANDARDS ARE PRESENTED IN TABLES. (HH)

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Association of State Institutions
of Higher Education in Colorado

December, 1963

EF 000885

PLANNING GUIDELINES

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IN COLORADO

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Association of State Institutions
of Higher Education in Colorado

December, 1963

PREFACE

These planning guidelines were developed for the Association of State Institutions of Higher Education in Colorado over the course of several years' study of higher education building requirements by a number of agencies and individuals. The standards of space utilization contained in the guidelines are those which were advanced by A. W. Baxter and Associates on behalf of the Committee on Education Beyond High School in June, 1960. The square footage allocations are those recommended by the planning consultant firm of Taylor, Lieberfeld and Heldman, Inc. to the Association in 1962. The guidelines have been adopted by the colleges and universities in Colorado as tools in institutional planning on the basis of the resolution on the following page.

In issuing the planning guidelines, the Association wishes to carefully note that they reflect quantitative measures only and do not at all review the quality of existing space. Qualitative factors are not easily subjected to the statistical kind of analysis suggested by the guidelines. It should also be noted that the planning criteria cannot always be applied to existing space since architectural limitations of room size and other design features will frequently prevent the attainment of the goals herein stated.

RESOLUTION

WHEREAS, The Association of State Institutions of Higher Education in Colorado has conducted a major combined study of building needs at the eight state-supported institutions of higher learning in the state, and

WHEREAS, An important element of this study was the uniform use of building standards and utilization factors as guidelines in the planning, and

WHEREAS, These standards were not those of the institutions but were the recommendations of outside professional consultants retained both by the Association and the Legislative Committee on Education Beyond High School, and

WHEREAS, These guides provide a uniform bench-mark from which campus building projects may be started,

NOW, THEREFORE, BE IT RESOLVED BY THE ASSOCIATION OF STATE INSTITUTIONS OF HIGHER EDUCATION IN COLORADO THAT

1. The set of utilization criteria developed by Alfred W. Baxter and Associates, and the square footage criteria by the firm of Taylor, Lieberfeld and Heldman, Inc. be adopted as planning guides for all state-supported campuses.

2. Each of the institutions agrees to use such criteria in the planning of new buildings and correcting the deficiencies in existing buildings with necessary modifications on each campus to be fully noted and explained.

3. The State Planning Division and the State Budget Office be requested to adopt the planning criteria as the official state guidelines for campus planning.

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Table 1

General Standards for Classroom Utilization

	A. Average Hours per Week of Scheduled Use per Room (H)	B. Average Per Cent Stations Occupied When Room is in Scheduled Use (U)	C. Average Weekly Student Periods per Classroom Station (H) (U)
University of Colorado	29	67%	19.4
Colorado State University	28	70%	19.6
Colorado State College	29	70%	20.3
Adams State College	27	64%	17.3
Western State College	29	70%	20.3
Colorado School of Mines	25	62%	15.5
Fort Lewis College*	29	61%	17.7
Southern Colorado State College	29	70%	20.3

*Fort Lewis standards will be affected by change to trimester program; the standards for Southern Colorado State College are the same as those for Colorado State College and Western State College rather than those recommended for Pueblo Junior College by Baxter.

Table 2

Planning Criteria for the Allocation of Space to Classroom-Type Facilities

Space Category	Primary Space[a] Area Per Station (square feet)	Primary Space[a] Program Area (square feet)	Service Space[b] (percent of program area)
REGULAR CLASSROOMS			
Capacity: 20 stations	17.6[c]	352	5-9%; use 7%.
: 30 stations	14.4[c]	432	
: 40 stations	13.0[c]	520	
: 50 stations	12.1[c]	605	
: 60 stations	11.5[c]	690	
: 75 stations	10.9[c]	818	
: 100 stations	12.7[d]	1,270	
: 125 stations	11.9[d]	1,488	
: 150 stations	11.3[d]	1,695	
: 175 stations	10.9[d]	1,908	
: 200 stations	10.6[d]	2,120	
SEMINAR - CONFERENCE ROOMS			
Capacity: 10 stations	20	200	5-9%; use 7%.
: 20 stations	20	400	
: 30 stations	18	540	
LECTURE AUDITORIUMS			
Capacity: 500 stations	9.2	4,600	15-25% use 20%.
: 1,000 stations	8.6	8,600	
: 1,500 stations	8.2	12,300	

---

[a] These are general classroom facilities. The unit allocation criteria permit inclusion of projection facilities, demonstration benches for science lectures, other special equipment in addition to the actual seating stations.

[b] This is a net addition to the primary space and is treated as a function of the aggregate allocation to primary space. Included are preparation rooms, projection booths, stages, dressing rooms, storage facilities.

[c] Includes two longitudinal aisles, no rear aisle.

[d] Includes three longitudinal aisles and one rear aisle.

Source: Taylor, Lieberfeld and Heldman, Inc., Consultants to the Work Group on Building Space Planning.

Table 3

Classroom Station Area Standards by Number of Stations in Room and Type of Room

No. of Stations	Sq. Ft. Occupied By Station	+	Sq. Ft. Per Room for Circulation	Assignable Sq. Ft. per Room - Range
Type 1 - Tablet-Armchairs, 2 longitudinal aisles, no rear aisle.				
16 - 25	8		190	320 - 390
26 - 35	8		195	390 - 475
36 - 45	8		200	475 - 560
46 - 55	8		205	560 - 645
56 - 70	8		210	645 - 770
71 - 90	8		220	770 - 940
Type 2 - Tablet-Armchairs, 3 longitudinal aisles, 1 rear aisle.				
91 - 125	8		470	1200 - 1470
126 - 175	8		495	1470 - 1895
176 - 225	8		520	1895 - 2320
Type 3 - Rows of Tables and Chairs, 2 longitudinal aisles.				
16 - 25	12		250	440 - 550
26 - 35	12		260	550 - 680
36 - 45	12		270	680 - 810
46 - 55	12		280	810 - 940
Type 4 - Lecture Auditoriums.				
176 - 225	8		520	1895 - 2320
226 - 375	8		530	2320 - 3530
376 - 500	8		600	3530 - 4600
501 - 1000	8		600	4600 - 8600
1001 - 1500	7.8		600	8600 - 12300
Type 5 - Seminar-Conference Rooms.				
-- - 10	20		(Included in Station Area)	- - 200
11 - 20	20			200 - 400
21 - 30	18			400 - 540

Table 4

Teaching Laboratory Utilization Rates
Recommended by A. W. Baxter, Jr., 1960

Institution	Laboratory Schedule Week in Hours	Average Schedule Density Threshold	Standard Average Hours Per Week Per Room	Average Student Hours/Week Per Station*
University of Colorado	30	27	24	19.2
Colorado State University	30	27	23	18.4
Colorado State College	30	28	24	19.2
Adams State College	30	26	22	17.6
Western State College	30	27	24	19.2
Southern Colorado State College**	30	28	24	19.2
Colorado School of Mines	30	25	20	16.0
Fort Lewis College**	30	28	24	19.2

Source: A. W. Baxter, Jr., Capital Outlay for Higher Education...in Colorado, Report to the Legislative Committee on Education Beyond High School, June, 1960, Tables 6A and 6B.

* Baxter does not make recommendations on station utilization rates; this figure assumes an average of 80% of stations occupied when room is in scheduled use. This figure is 80% of the standard average hours per week per room.

** S.C.S.C. taken at same rate as C.S.C.; Fort Lewis at same rate as C.S.C., assuming higher utilization expected from trimester program.

Table 5

Optimum Scheduling Possibilities in Teaching Laboratories
According to Hours Per Week in Laboratory
and Hours Per Week in Associated
Lecture or Recitation

Laboratory Hours Per Week in Course	Lecture and Recitation Hours/Week Associated With Lab	Critical Maximum Room Hours Per Week H'	Optimum Number of Lab Sections per Rooms to be Scheduled Without Conflict N	Recommended Optimum Student Hours Per Station Per Week U'
2	1	36	18	28.8
2	2	34	17	27.2
2	3	32	16	25.6
2	4	30	15	24.0
2	5	28	14	22.4
3	1	27	9	21.6
3	2	24	8	19.2
3	3	21	7	16.8
3	4	18	6	14.4
3	5	15	5	12.0
4	1	36	9	28.8
4	2	32	8	25.6
4	3	28	7	22.4
4	4	24	6	19.2
4	5	20	5	16.0
6	1	24	4	19.2
6	2	24	4	19.2
6	3	18	3	14.4
6	4	18	3	14.4
6	5	12	2	9.6

Table 6

Area Standards for Teaching Laboratories

Taylor, Lieberfeld and Heldman, Inc., Consultants to the

1100. Agricultural Sciences: Recommended Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Small Departments
1101 Agronomy				
Lower	40	Soils	)	
Upper	45	Soil chemistry; physics; microbiology; weed control; field crops	)	- 28 -
Graduate	--	--	)	
1102 Animal Husbandry				
Lower	40	Chemical analysis	)	
	80	Feeding; meat technology; care	)	
Upper	50	Breeding; reproduction; physiology; endocrinology; nutrition	)	- 24 -
Graduate	--	--	)	
1103 Dairy Husbandry				
Lower	40	Chemical analysis	)	
	80	Feeding; milking methods; animal care	)	
Upper	50	Chemical analysis; nutrition; breeding; physiology of lactation	)	- 30 -
Graduate	--	--	)	
1104 Dairy Manufacturing				
Lower	--	Basic installation will vary	)	
Upper	--	with departmental programs	)	- 25 -
Graduate	--	--	)	
1105 Farm Management				
Lower	--	--	)	
Upper	--	--	)	--

Table 6 (Continued)

1100. Agricultural Sciences (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Small Departments
1106 Horticulture				
Lower	30	General; lawn management	)	
Upper	45	Flower arrangement; taxonomy; germination and propagation	)	- 24 -
Graduate	--	--	)	
1107 Ornamental Horticulture				
Lower	--		)	
Upper	--	see horticulture	)	
Graduate	--		)	
1108 Poultry Husbandry				
Lower	35	Genetics	)	
Upper	45	Nutrition; physiology	)	- 30 -
Graduate	--	--	)	
1111 Forestry and Range Management				
Lower	--	--	)	
Upper	35	--	)	- 30 -
Graduate	--	--	)	
1112 Watershed Management				
Lower	--	--	)	
Upper	--	--	)	--
Graduate	--	--	)	

Table 6 (Continued)

1200. Biological Sciences: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Small Departments
1201 Biological Sciences				
Lower	35	General; introductory		
Upper	--	--	- 24 -	
Graduate	--	--		
1202 Biology, General				
Lower	35	See Botany and Zoology		
Upper	45	See Botany and Zoology	26	28
Graduate	60	See Botany and Zoology		
1203 Botany				
Lower	35	Elementary; plant anatomy; taxonomy		
Upper	45	Morphology; mycology; microtechnique; plant physiology; taxonomy	29	21
Graduate	60	Pathology; microtechnique		
1204 Zoology				
Lower	35	Introductory; elementary; comparative anatomy; physiology		
Upper	45	Vertebrate; invertebrate; cytology; embryology; enzymology; parasitology; histology; morphology; ornithography; ecology; limnology; taxonomy	20	14
Graduate	60	--		
1205 Anatomy and Histology				
Lower	35	Histology; developmental anatomy		
	60	Gross anatomy		
Upper	45	Microscopic anatomy; vertebrate morphology	28	20
Graduate	60	--		

1200. Biological Sciences (Continued)

Table 6 (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1206 Bacteriology				
Lower	--	--		
Upper	45	Serology; virology; pathogenic; immunology; hematology		
Graduate	60	--		
1207 Biochemistry				
Lower	--	--		
Upper	50	Physical organic; nutrition; enzymology		
Graduate	60	--		
1208 Biophysics				
Lower	--	--		
Upper	45	Radiation biology; cellular processes		
Graduate	60	--		
1209 Entomology				
Lower	35	Elementary; introductory		
Upper	45	Physiology; taxonomy; ecology; limnology; toxicology; morphology		
Graduate	60	--		
1211 Genetics				
Lower	35	Elementary		
Upper	45	Cytology; cytogenetics; microbial genetics		
Graduate	60	--		
1212 Pathology				
Lower	--	--		
Upper	45	Hematology; infectious diseases; pathogenic; pathological anatomy		
Graduate	60	--		

- 32 -
- 24 -
- 24 -
- 24 -
- 24 -

Table 6 (Continued)

1200. Biological Sciences (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1213 Plant Pathology				
Lower	35	Elementary; general		
Upper	45	Cytology; morphology of fungi; mycology; nematology	- 24 -	
Graduate	60	--		
1214 Physiology				
Lower	--	--		
Upper	45	Pharmacology; chemical physiology		
	100	Experimental; animal physiology	- 24 -	
Graduate	--	--		
1215 Microbiology				
Lower	--	--		
Upper	45	Dairy microbiology; bacterial cytology; pathogenic; soil microbiology	- 24 -	
Graduate	60	--		

Table 6 (Continued)

1300. Mathematical Sciences: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1301 Applied Mathematics				
Lower	--	--		
Upper	--	--		--
Graduate	--	--		
1302 Computer Science				
Lower	--			
Upper	20	In seminar-classroom. Actual machine area will depend upon size of installation. A typical teaching-oriented installation, excluding office and instructional area, would require 800 square feet.		- 19 -
Graduate	20			
1303 Mathematics				
Lower	--	--		
Upper	--	--		--
Graduate	--	--		
1304 Statistics				
Lower	25	Elementary		
Upper	30	Intermediate; advanced		- 9 -
Graduate	--	--		

Table 6 (Continued)

1400. Physical Sciences: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1401 Physical Science, General				
Lower	35	General science subjects	23	24
Upper	--	--		
Graduate	--	--		
1402 Astrophysics				
Lower	--	--		
Upper	50	--	23	24
Graduate	60	--		
1403 Astrogeophysics				
Lower	40	--		
Upper	45	--	23	24
Graduate	60	--		
1404 Atmospheric Science (including Meteorology)				
Lower	40	--		
Upper	50	--	23	24
Graduate	60	--		
1405 Chemistry				
Lower	40	General; elementary		
	45	Quantitative; qualitative; organic		
Upper	50	Advanced organic; qualitative; quantitative; biochemistry	26	24
	60	Physical chemistry		
Graduate	60	--		

Table 6 (Continued)

1400. Physical Sciences (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area	
			Large Departments	Small Departments
1406 Geology				
Lower	40	Elementary; general	14	23
Upper	40	Mineralogy; paleontology; crystallography		
	50	Stratigraphy; petrology; petrography; mapping; cartography; lithology		
Graduate	60			
1407 Physics				
Lower	40	General; elementary; principles; introductory	24	26
Upper	45	Intermediate; electronics; heat; mechanics; optics; modern physics electricity		
Graduate	60	Atomic physics		
1408 Engineering Physics				
Lower	40	--	23	24
Upper	45	--		
Graduate	60	--		
1409 Astronomy				
Lower	25	--	23	24
Upper	50	--		
Graduate	60	--		

Table 6 (Continued)

1500. Engineering Sciences: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1501 Aeronautical				
Lower	--	--	)	
Upper	150	--	)	- 18 -
Graduate	--	--	)	
1502 Agricultural				
Lower	--	--	)	
Upper	60	Soil and water engineering	)	
	45	Electricity	)	
	115	Farm metal work; shop work	)	- 18 -
	85	Structures	)	
	150	Farm machinery; equipment	)	
Graduate	--	--	)	
1503 Architectural				
Lower	--	--	)	
Upper	--	see architecture	)	
Graduate	--	--	)	
1504 Chemical				
Lower	--	--	)	
Upper	150	Unit operations	)	
	60	Physical chemistry	)	- 18 -
	30	Instrumentation	)	
Graduate	--	--	)	
1505 Civil				
Lower	--	--	)	
Upper	75-100	Hydraulics; concrete	)	
	60	Soils	)	- 18 -
	150	Strength of materials	)	
	50	Photogrammetry	)	
Graduate	--	--	)	

Table 6 (Continued)

1500. Engineering Sciences (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1506 Electrical				
Lower	--	--	)	
Upper	75	Circuits	)	
	125	Machines; power engineering	)	
	45	Measurements; control systems; electronics	)	- 18 -
Graduate	--	--	)	
1507 Geological				
Lower	--	--	)	
Upper	--	see geology	)	
Graduate	--	--	)	
1508 Geophysical				
Lower	--	--	)	
Upper	50	Seismology	)	
	45	Electricity; magnetism; electronics; circuitry	)	- 18 -
	100	Prospecting technology; well logging	)	
Graduate	--	--	)	
1509 Mechanical				
Lower	--	--	)	
Upper	200	Mechanical; manufacturing processes; thermodynamics	)	- 18 -
	50	Machine shop; machines	)	
Graduate	--	--	)	
1510 Metallurgical				
Lower	--	--	)	
Upper	40	Microscopy	)	
	120	Speotrography	)	- 18 -
	70	Physical metallurgy	)	
Graduate	--	--	)	

Table 6 (Continued)

1500. Engineering Sciences(Continued)

Subject and Division	Area Per Station (Square Feet)	Sources	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1511 Mining				
Lower	--	--	)	
Upper	125	Unit operations; production	)	- 18 -
Graduate	--	--	)	
1512 Petroleum				
Lower	--	--	)	
Upper	150	Production	)	- 18 -
Graduate	--	--	)	
1513 Petroleum Refining				
Lower	--	--	)	
Upper	150	Unit operations	)	
	100	Chemical processes	)	- 18 -
Graduate	--	--	)	
1514 General, Engineering Science				
Lower	--	--	)	
Upper	--	--	)	
Graduate	--	--	)	
1515 Industrial				
Lower	--	--		
Upper	65	Processes, time and motion	)	- 18 -
Graduate	--	--	)	

Table 6 (Continued)

1700. Social Sciences (Laboratory-Oriented): Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1701 Anthropology - Archaeology				
Lower	35	Physical anthropology; analysis of archaeological specimens		
Upper	25	Linguistics		
	45	Advanced physical anthropology	All - 18	
Graduate	--	--		
1702 Geography				
Lower	35	Physical geography		
Upper	50	Cartography	All - 15	
Graduate	--	--		
1703 Psychology				
Lower	40	Experimental; introductory		
Upper	50	Physiological psychology		
	45	Learning; perception; advanced experimental	All - 19	
	75	Testing		
Graduate	60	--		
1704 Sociology				
Lower	--	--		
Upper	300	Observation-experimental room[a]		
	12	Observation booth station	All - 27	
	75	Interview and testing booths		
Graduate	--	--		

[a] Typical; could vary in size and might also serve dual function as conference or seminar room.

Table 6 (Continued)

1700. Social Sciences (Laboratory-Oriented) (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1705 Behavioral Science				
Lower	--	--	)	
Upper	--	--	)	--
Graduate	--	--	)	
1706 Library Science and Bibliography				
Lower	--	--	)	
Upper	50	Library methods	)	All - 18
Graduate	--	--	)	

Table 6 (Continued)

1800. Arts and Crafts: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
1801 Architecture				
Lower	35	Elementary design; projections; drawing and rendering	15	30
Upper	50	Design		
	40	Furniture design, interiors		
Graduate	--	--		
1802 Fine Arts				
Lower	35	Introductory; drawings; painting; materials and techniques	24	18
Upper	45	Advanced painting		
	50	Sculpture; ceramics; pottery; crafts		
Graduate	75	Individual studios		
1803 Commercial Arts				
Lower	35	Introductory advertising design	- 19 -	
Upper	45	Advanced advertising design		
Graduate	--	--		
1804 Industrial Arts and Crafts				
Lower	50	Woodworking	- 20 -	
	50	Machine shop		
Upper	80	Welding, sheetmetal		
	40	Electronics		
Graduate	--	--		
1805 Landscape Architecture				
Lower	--	--	see architecture	
Upper	50	--		
Graduate	--	--		

Table 6 (Continued)

1800. Arts and Crafts (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area	
			Large Departments	Small Departments
1806 Music				
Lower	--	N.B. Individual practice room requires 80 square feet; allow 15 square feet per participant for large group practice rooms such as choral, band, orchestral groups.	21	29
Upper	--			
Graduate	--			
1807 Planning				
Lower	--	--	see architecture	
Upper	50	--		
Graduate	--	--		
1808 Engineering Drawing, Graphics, Design				
Lower	35	Drawing; drafting	10	21
	30	Engineering drawing		
Upper	40	Graphics; design; advanced drafting		
Graduate	--	--		

Table 6 (Continued)

1900. - 2300. Selected Subject Fields: Planning Criteria for the Allocation of Space to Teaching Laboratory Facilities

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments / Small Departments
1900 - Languages and Literature			
1900 Language Laboratories Lower) Upper) Graduate)	25	N.B. Booth requires 25 square feet. Recording room requires 75 square feet. Control station with console included in above station criterion.	- 17 -
1906 Speech and Drama Lower Upper Graduate	-- -- --	N.B. Basic stage and pit setup varies in size with character of theatre; i.e., both size and style. A basic proscenium type stage setup can be accommodated in 2700 square feet. About 300 square feet are required for the orchestra pit. A practice studio stage need not be more than 200 square feet. The service space coefficient applies to total space, excluding seating and theatre lobby area.	- 33 -
2100 - Business - General			
2101 Accounting Lower) Upper) Graduate)	25	General accounting work	- 0 -

Table 6 (Continued)

1900. - 2300. Selected Subject Fields (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area: Large Departments	Service Space as Percent of Total T-Lab Area: Small Departments
2100 - Business - General (Continued)				
2103 Commercial Practice, Secretarial				
Lower) Upper)	25	Typewriter work; calculator work	- 12 -	
Graduate	--	--		
2106 Management				
Lower	--	--		
Upper	40	Time and motion analysis	- 15 -	
Graduate	--	--		
2300 - Home Economics				
2301 General Home Economics				
Lower	40)	These criteria are across-the-board		
Upper	50)	averages for typical range of home	- 27 -	
Graduate	--)	economics courses.		
2302 Family and Child Development				
Lower	--)	Depends upon whether nursery school		
Upper	--)	is operated and character of	- 28 -	
Graduate	--)	programs offered		
2303 Clothing and Textiles				
Lower	25	Materials		
	40	Textile chemistry		
Upper	45	Patternmaking; design, costuming; sewing	- 17 -	
Graduate	--	--		

Table 6 (Continued)

1900. - 2300. Selected Subject Fields (Continued)

Subject and Division	Area Per Station (Square Feet)	Courses	Service Space as Percent of Total T-Lab Area	
			Large Departments	Small Departments
2300 - Home Economics (Continued)				
2304 Foods and Nutrition				
Lower	40	Food chemistry; elementary nutrition		
Upper	50	Nutrition		
	60	Food preparation and analysis; experimental cookery		
	25	Taste panel		
Graduate	--	--		

Table 7

Illustrative Unit Space Allocation Criteria for Staff Work Stations in Office-Type Space

Unit Standard Category	Unit Space Allocation Standard (Square Feet)	Staff Category
	Single Occupancy Office Station	
Unit S-1	300	Faculty and other professional: e.g., President; Vice President, Dean
Unit S-2	200	Faculty and other professional: e.g., Chairman, academic or research department; Director, major administrative department
Unit S-3	120	Faculty and other professional: e.g., research scientist; director of small administration department; professional staff in administration Supporting technical: e.g., plant maintenance supervisor Supporting clerical: e.g., Dean to secretary; office manager
	Multiple Occupancy Office Station	
Unit M-1	80-90	Faculty and other professional: e.g., accountant Supporting technical: e.g., foreman Supporting clerical: e.g., bookkeeper; office manager
Unit M-2	60-65	Supporting clerical: e.g., clerk-typist
Unit M-3	40-60	Faculty and other professional: e.g., teaching assistant Supporting technical: e.g., laboratory research assistant; data analyst Supporting clerical: e.g., statistical clerk Other: e.g., graduate student

(Taylor, Lieberfeld and Heldman, Inc.)

Table 8

Illustrative Planning Ratios, Office Service Space to Total and Primary Office Space

Category	Office Space Ratios: Service Space/ Total Space	Office Space Ratios: Service Space/ Primary Space
All types of departments	.20	.25
Academic departments	.16	.19
Administrative departments	.43	.76
Number of work stations		
Academic departments		
0-9	.31	.46
10-19	.17	.20
20-29	.16	.19
30-49	.16	.19
50-74	.14	.16
75 and over	.14	.16
Administrative departments		
0-9	.49	.96
10-29	.47	.90
30 and over	.27	.37

(Taylor, Lieberfeld and Heldman, Inc.)

Table 9

Illustrative Unit Space Allocation Criteria for Selected Service Elements in Office-Type Space

Item	Dimensions (l x w)	Unit Space Allocation Standard (Square Feet)
Files		
Letter	2'6" x 1'3"	10
Legal	2'6" x 1'6"	12
Bookcase	3'0" x 1'0"	12
Supply cabinet	3'0" x 1'6"	14
Coat rack	4'3" x 1'4"	19
Work table	5'0" x 2'6"	39
Side chair	1'6" x 1'6"	7
Typewriter stand	34" x 18"	21
Safe	3'6" x 2'6"	50
Keypunch	2'7" x 2'4"	28

(Taylor, Lieberfeld and Heldman, Inc)

Table 10

Selected Subject Fields: Planning Criteria for the Allocation of Space to Research Facilities

Subject	Area Per Station		Service Space as Percent of Total Research Space	
	Faculty and Professional	Student	Large Departments	Small Departments
	(Square Feet)			
1100 Agricultural Sciences				
1101 Agronomy	110	70	- 55 -	
1102 Animal Husbandry	120	80	- 55 -	
1103 Dairy Husbandry	110	70	- 55 -	
1104 Dairy Manufacturing	-	-	-	
1105 Farm Management	-	-	-	
1106 Horticulture	110	70	55	50
1107 Ornamental Horticulture	110	70	55	50
1108 Poultry Husbandry	110	70	- 70 -	
1111 Forestry and Range Management	100	60	- 50 -	
1112 Watershed Management	-	-	-	
1200 Biological Sciences				
1201 Biological Science	-	-	-	
1202 Biology, General	110	70	- 40 -	
1203 Botany	110	70	50	40
1204 Zoology	110	70	40	45
1205 Anatomy and Histology	110	70	- 40 -	
1206 Bacteriology	110	70	- 40 -	
1207 Biochemistry	110	70	- 25 -	
1208 Biophysics	110	70	- 25 -	
1209 Entomology	110	70	- 50 -	
1211 Genetics	110	70	- 40 -	
1212 Pathology	110	70	- 55 -	
1213 Plant Pathology	110	70	- 40 -	
1214 Physiology	120	80	- 40 -	
1215 Microbiology	110	70	- 40 -	

(Continued)

Table 10 (Continued)

Subject	Area Per Station: Faculty and Professional	Area Per Station: Student	Service Space as Percent of Total Research Space: Large Departments	Service Space as Percent of Total Research Space: Small Departments
	(Square Feet)			
1300 Mathematical Sciences				
1301 Applied Mathematics	a	a	-	
1302 Computer Science	a	a	-	
1303 Mathematics	a	a	-	
1304 Statistics	a	a	-	
1400 Physical Sciences				
1401 Physical Science, General	-	-	-	-
1402 Astrophysics	a	a	-	-
1403 Astrogeophysics	a	a	-	-
1404 Atmospheric Science	100	60	- 70 -	
1405 Chemistry	110	75	25	20
1406 Geology	100	60	20	50
1407 Physics	110	75	40	35
1408 Engineering Physics	110	75	- 35 -	
1409 Astronomy	110	75	- 35 -	
1500 Engineering Sciences				
1501 Aeronautical	120	80	- 25 -	
1502 Agricultural	120	80	- 25 -	
1503 Architectural	90	60	- 25 -	
1504 Chemical	110	70	- 25 -	
1505 Civil	100	60	- 25 -	
1506 Electrical	100	60	- 25 -	
1507 Geological	100	60	- 25 -	
1508 Geophysical	100	60	- 25 -	
1509 Mechanical	100	60	- 25 -	
1510 Metallurgical	110	75	- 25 -	

(Continued)

Table 10 (Continued)

Subject	Area Per Station: Faculty and Professional (Square Feet)	Area Per Station: Student (Square Feet)	Service Space as Percent of Total Research Space: Large Departments	Service Space as Percent of Total Research Space: Small Departments
1500 Engineering Sciences (continued)				
1511 Mining	110	75	- 25 -	
1512 Petroleum	110	75	- 25 -	
1513 Petroleum Refining	110	75	- 25 -	
1514 General, Engineering Science	-	-	-	
1515 Industrial	100	60	- 25 -	
1600 Social Sciences (A. Non-Laboratory)	a	a	-	
1700 Social Sciences (B. Laboratory)				
1701 Anthropology - Archeology	110	70	- 70 -	
1702 Geography	100	60	- 70 -	
1703 Psychology	110	70	20	25
1704 Sociology	a	a	-	
1705 Behavioral Science	a	a	-	
1706 Library Science and Bibliography	a	a	-	
1800 Arts and Crafts				
1801 Architecture	90	60	- 25 -	
1802 Fine Arts	b	b	-	
1803 Commercial Arts	-	-	-	
1804 Industrial Arts and Crafts	-	-	-	
1805 Landscape Architecture	-	-	-	
1806 Music	b	b	-	
1807 Planning	90	60	- 25 -	
1808 Engineering Drawing, Graphics, Design	90	60	- 25 -	

(Continued)

Table 10 (Continued)

	Subject	Area Per Station: Faculty and Professional	Area Per Station: Student	Service Space as Percent of Total Research Space: Large Departments	Service Space as Percent of Total Research Space: Small Departments
		(Square Feet)			
1900	Languages and Literature	a	a	-	
2100	Business - General	a	a	-	
2200	Education	c	c	-	
2300	Home Economics				
	2301 General Home Economics	110	70	- 35 -	
	2302 Family and Child Development	-	-	-	
	2303 Clothing and Textiles	110	70	- 35 -	
	2304 Foods and Nutrition	110	70	- 50 -	
2400	Law	a	a	-	
2500	Journalism	a	a	-	
2600	Health Professions				
	2601 Dentistry	-	-	-	
	2602 Medicine	-	-	-	
	2603 Nursing	-	-	-	
	2604 Pharmacy	110	70	- 50 -	
	2605 Veterinary Medicine	120	80	- 60 -	
	2606 Medical Technology	-	-	-	
	2607 Occupational, Physical, Speech Therapy	110	70	- 55 -	
	2608 Pre-Medicine, Pre-Dentistry, Pre-Nursing	-	-	-	

(Continued)

Table 10 (Continued)

Subject	Area Per Station		Service Space as Percent of Total Research Space	
	Faculty and Professional	Student	Large Departments	Small Departments
	(Square Feet)			

[a] No special research space criteria apply. In fact, it is usually the case that only office space is needed.

[b] See studio criteria under teaching laboratories.

[c] Research usually is conducted in the classroom, teaching laboratory, office, or library.

Table 11

Planning Criteria for the Allocation of Space to Library Facilities*

Item	Planning Criterion	
Reading space		
Reader stations as per cent of enrollment	25	%
Area per reader station (square feet)		
General reading rooms[a]	18	a.s.f.
Special reading rooms[b]	22.5	a.s.f.
Carrels	30	a.s.f.
Faculty study stations	48**	a.s.f.
Book storage		
Area per volume (square feet)		
Closed stack space	.080	a.s.f.
Open shelving in reading rooms	.133	a.s.f.
Open stacks	.100**	a.s.f.

Service space as per cent of total library space	Large[c]	Small[d]
Including library office space	19%	23%
Excluding library office space	17%	20%

---

[a] For rooms with 60 or more stations.

[b] Periodicals, reference, etc.; for reading rooms with 40 stations or less.

[c] Total library space of 40,000 square feet or greater.

[d] Total library space of less than 40,000 square feet.

* These unit area standards are recommended by Taylor, Lieberfeld and Heldman, Inc., consultants to the Work Group on Building Space Planning and Capital Outlay, except as noted below.

** The units for faculty study cubicles and for open stack shelving are recommended by Dr. Ralph E. Ellsworth, Director of Libraries, University of Colorado.

Table 12

Planning Criteria for Specific Types of
Physical Education and Athletic Indoor Facilities
(Taylor, Lieberfeld and Heldman, Inc.)

	Assignable Square Feet
Planning criteria for selected athletic plant elements:*	
Basketball courts:	
Practice court	4,370
Competition court	6,240
Combination of 2 practice courts and 1 competition court	8,735
Baseball diamond (infield for fieldhouse)	16,900
Football cage (fieldhouse)	19,260
Indoor track: 1/4 mile, 6 lanes	33,000
Handball: 4-wall court	1,060
Handball: 1-wall court	680
Squash: doubles court	1,125
Squash: singles court	595
Shuffleboard	625
Volley ball (per court)	3,025
Wrestling (per mat)	1,155
Boxing:	
Ring (1)	900
Punching bag (per bag)	15
Punching bag, heavy (per bag)	35
Pool (Olympic standards - 6 lanes)	7,130
Exercise room (per person)	50
Rifle range (per point or firing position)	400
Pistol range (per point or firing position)	320
Fencing (per strip)	325
Spectator seating, foldable (per seat)	2.5
Lockers (per locker)	
Varsity rooms	10
General locker room	6.75
Tote basket	.50
Showers (per head, gang showers)	16
Shower-dressing stall for women (per unit)	24
Ticket booth	25
First aid, training, physical therapy room	750

* With the exception of self-contained facilities (e.g., handball and squash courts), the criteria all include allowances for buffer zones or circulation space around actual playing or competition area. Clearly, there is room for variation from these figures since competition areas need not be regulation-size or more than single units may be combined with resulting savings in circulation space needs.

Table 13

Planning Criteria for the Allocation of Space to Student Residential Facilities

Item		Planning Criterion	
Single occupancy			
Net area per room (square feet)			108 a.s.f.
Space distribution (per cent):		100%	148 a.s.f.
Living quarters	73%		108 a.s.f.
Toilets, washrooms, showers	8%		12 a.s.f.
Recreational and service[a]	19%		28 a.s.f.
Double occupancy			
Net area per room (square feet)			190 a.s.f.
Space distribution (per cent):		100%	268 a.s.f.
Living quarters	71%		190 a.s.f.
Toilets, washrooms, showers	10%		28 a.s.f.
Recreational and service[a]	19%		50 a.s.f.
Married Student and Faculty-Staff Housing			
1-bedroom unit			620 a.s.f.
2-bedroom unit			750 a.s.f.

[a] Excluding food service facilities.

Table 14

Planning Criteria for the Allocation of Space to Food Service Operations

Item	Planning Criterion
Dining space	
Space per dining station (square feet)	
Family style	12.5 a.s.f.
Cafeteria style	11.0 a.s.f.
Snack bars	10.0 a.s.f.
Number of sittings (turnover factor) at peak interval	
Family style	2
Cafeteria style	4
Snack bars	-
Preparation, serving, cleanup	
Space per dining station (square feet)	
Family style	8.5 a.s.f.
Cafeteria	7.5 a.s.f.
Snack bars	5.5 a.s.f.
Storage and miscellaneous as per cent of total food service space	25 %

Table 15

Planning Criteria for Staff and Student Services Facilities

Item	Planning Criterion (Square Feet)
Staff and Student Service Facilities	
Staff service facilities	
Over-all allocation per staff member[a]	4
Student service facilities[b]	
Over-all allocation per enrolled student	9.75
Selected student service components:	
Lockers: per locker (full size, floor standing)	6.75
Lounges, common rooms; per station	20
Post office: per mailbox (including auxiliary service facilities such as counters, etc.)	.75
Meeting room: per station	20
Barber shop: per chair	100
Billiards: per table	320
Bowling alley: per lane	575
Kitchenette	20
Table tennis: per table	345

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[a] This covers all lounge and common room facilities for faculty and other professional staff and supporting technical and clerical personnel. Kitchenette facilities are included, but regular food service facilities, such as cafeterias, are not.

[b] The planning criterion of 9.75 square feet per student would apply only in the absence of student center facilities. Should student center facilities be available, the service areas outside the student center could be scaled down to about 1.5 square feet per student. The planning criterion for the allocation of space per student in student center facilities will vary widely since it is largely dependent upon the character and extent of the individual space or activity components that are included. Planning criteria for selected student center elements are listed in the table.

Table 16

PHYSICAL PLANT MAINTENANCE AND OPERATION FACILITIES

Building area for the shops, storage, and other facilities required for the maintenance and operation of physical plant, buildings and grounds, and service components of the institution may best be estimated by a general analysis of the requirements of such operations in consultation with the business manager and physical plant superintendent. As a rule, these components are not strongly related to institutional size, but constitute certain minimum fixed requirements. As the total floor area of the institutional plant (including housing) passes certain magnitudes, additional floor area for buildings and grounds service operations may be required.

As a general guideline, the consultant has provided the empirical rule-of-thumb criteria for physical plant service building space listed in Table XIV-1, along with the qualifying footnote.

Obviously, these criteria, expressed in assignable square feet of physical plant service area per 1,000 gross square feet of all other building area to be maintained and serviced, cannot be applied until the total floor area requirements of all other facilities are compiled in Section XV (following).

If, however, the institution prefers to use other estimates, these should be entered on Form 14 with explanatory attachments.

Physical Plant Maintenance and Operation Facilities

Item	Planning Criterion (Square Feet)
Buildings and Grounds - Service Buildings	
Service building space per thousand square feet of total physical plant:[f]	
Total	47.2
Offices space	4.0
Maintenance shops	11.0
Heating plant	8.6
Garages	8.4
General storage	12.5
Miscellaneous other	2.7

[f] Since institutional plant varies in size and location, these figures are not universally applicable. For example, heating plant very likely declines relative to total plant as the total size of the plant increases. Conversely, maintenance shops probably increase in relative importance and begin to perform projects that were formerly subcontracted. Once again, these figures should be used as a point of departure and only in this initial phase of gross approximation of future physical plant requirements.

Source: Taylor, Lieberfeld and Heldman, Inc.

Table 17

F. W. Dodge Construction Cost Index

Labor and Materials, Brick and Concrete Commercial and Factor Buildings

Denver Area*

Year	Index (1926-29 = 100)	Per Cent Increase over 1955	Per Cent Increase over 1958
1955	273.2	-	-
1956	282.3	3.3	-
1957	293.1	7.3	-
1958	295.9	8.3	-
1959	302.9	10.9	2.4
1960	309.0	13.1	4.4
1961	316.1	15.7	6.8
1962 (6/1)	327.9	20.0	10.8
Average per cent increase per year:		2.86%	2.70%

Projected at Increase Rate of +2.7 Per Cent per Year		
1963	336.7	
1964	345.8	
1965	355.1	
1966	364.7	
1967	374.5	
1968	384.6	Per Cent Increase Since 1962
1969	395.0	
1970	405.0	23.5

*Source: Architectural Record, Western Edition, October, 1962, p. 32-12